

REMARKS

Claims 1-6, 11, 13 and 15-17 are pending in this application, claims 7-10, 12 and 14 having been cancelled by the above amendment. Of these claims, claims 1-17 stand rejected under 35 USC §103(a) as being unpatentable over Hertz et al.

In view of the preceding amendments and the following remarks, this rejection is traversed, and reconsideration of this application is respectfully requested.

Applicant's invention is an extreme ultraviolet radiation (EUV) source that includes a source nozzle for emitting a target material stream to a target area where it is irradiated by a laser beam to produce a plasma and EUV radiation. According to one embodiment of the claimed invention, the target stream travels a distance of 10 cm or more from the source nozzle to the target area. By moving the target area this far away from the source nozzle, the target material is completely frozen by the time it reaches the target area. Therefore, evaporative cooling that occurs as a result of the target material freezing in the vacuum environment has completely stopped because the stream is completely frozen. Thus, the vapor that is generated by the evaporative cooling is not present at the target area to absorb the EUV radiation, which would otherwise decrease the source performance. Additionally, the source nozzle, which is conductive, is far enough away from the target area so that arcing created by the plasma does not damage the nozzle. Applicant submits that the prior art of record does not teach or suggest a target area that is a distance of 10 cm or more away from the source nozzle.

According to another embodiment of the invention, as claimed in independent claim 11, the target material stream is emitted from the source nozzle at a slow enough

speed, specifically 10 millimeters per second, so that the target material stream is completely frozen when it reaches the target area. Applicant respectfully submits that the prior art of record also does not teach or suggest an EUV radiation source emitting a target material stream at this slow of a speed.

Hertz et al. teaches an apparatus for generating EUV radiation that includes an outlet nozzle 6 emitting a target stream or jet 2 that is irradiated by a laser beam 1 to generate a plasma P. Hertz et al. discusses that the jet 2 freezes before it reaches the target area. Hertz et al. also discusses the effects of evaporative cooling on the absorption of the EUV radiation generated by the plasma and minimizing erosion of the nozzle 6. Page 5, lines 27-31 specifically states that the target stream travels a “large distance” between the outlet of the nozzle and the beam-jet interaction area. However, Hertz et al. goes on to state in lines 31 and 32 on page 5 that this “large distance” is only a few millimeters.

Applicant respectfully submits that a few millimeters is very different than 10 cm in an EUV source environment. Applicant further submits that a few millimeters does not provide a complete reduction of EUV absorption as a result of evaporative cooling vapors, and does not reduce erosion of the nozzle from arcing to a significant enough level. Contrary, Applicant submits that if the target area is only a few millimeters from the nozzle, a significant amount of evaporative cooling vapor would still be present that would act to absorb the EUV radiation because the target stream is not frozen all the way through.

Applicant further submits that Hertz et al. does not move the target area more than a few millimeters away from the nozzle outlet because instabilities in the stream

would cause it to break up before it reached the target area which would prevent it from being effectively irradiated by the laser beam. In Applicant's EUV source the stream instabilities are addressed so that the target area can be moved more than 10 cm away from nozzle area where evaporative cooling vapors and nozzle arcing would be non-existent. Applicant respectfully submits that Hertz et al. does not come anywhere near teaching or suggesting that the distance from their output nozzle to the target area can be any distance approaching 10 cm. Therefore, Applicant submits that Hertz et al. cannot make obvious independent claims 1 and 13.

With respect to independent claim 11, Applicant's EUV source causes the stream to be emitted from the nozzle at a much slower rate than was previously known in the art to allow it to completely freeze by the time it reaches the target area. Applicant submits that EUV sources known in the art do not completely freeze the target stream before it reaches the target area because the stream is traveling too quickly. Applicant submits that the Hertz et al. stream may be frozen on the outside, but is not frozen all of the way through by the time it reaches the target area only a few millimeters away from the nozzle.

Further, Hertz et al. specifically identifies their target stream speed. Particularly, page 11, lines 3-6, states that the speed of the jet 2 is about 10 meters per second to a few hundred meters per second. Applicant submits that these speeds are very different than 10 millimeters per second as specifically recited in Applicant's independent claim 11 as amended. Therefore, Applicant respectfully submits that Hertz et al. also cannot make obvious independent claim 11.

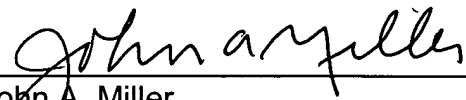
In view of the amendments and discussion above, it is respectfully requested that the §103(a) rejection be withdrawn.

It is now believed that this application is in condition for allowance. If the Examiner believes that personal contact with Applicant's representative would expedite prosecution of this application, he is invited to call the undersigned at his convenience.

Respectfully submitted,

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